Having thus described the preferred embodiments, the invention is claimed to be:

1. A magnetic resonance imaging apparatus comprising:

a main magnet (12) for generating a main magnetic field in an examination region (14);

a plurality of gradient coils (22) for setting up magnetic field gradients in the main field;

an RF transmit coil for transmitting RF signals into the examination region to excite magnetic resonance in a subject disposed therein;

an RF receive coil (16) for receiving RF signals from the subject, the RF receive coil including a first loop (101) and a second loop (102), the first and second loops being disposed substantially in a similar plane; and

a signal combiner (120) for combining the signals received by the first and second loops in a quadrature mode.

2. A magnetic resonance imaging apparatus as set forth in claim 1 wherein geometric centers of the first and second loops are displaced with respect to one another in a direction perpendicular to the main magnetic field.

3. A magnetic resonance imaging apparatus as set forth in claim 2 wherein the first and second loops are overlapped to reduce mutual inductance between the loops.

4. A magnetic resonance imaging apparatus as set forth in claim 1 wherein the RF signals received by the first and second loops have components in first (x) and second (y) directions, the first and second directions being perpendicular to the main magnetic field.

5. A magnetic resonance imaging apparatus as set forth in claim 4 wherein the signal combiner combines the RF signals associated with the first and second loops in the first direction by adding said signals phase shifted one-hundred eighty degrees with respect to one another and the signal combiner combines the RF signals associated with the first and second loops in the second direction by adding said signals in phase.

6. A magnetic resonance imaging apparatus as set forth in claim 1 further comprising switching means for switching the signal combiner from quadrature mode to a phased array mode.

7. A magnetic resonance imaging apparatus as set forth in claim 1 wherein the first and second loops have similar geometries with respect to one another.

8. A magnetic resonance imaging apparatus comprising:

a main magnet for generating a main magnetic field in an examination region;

an RF transmit coil positioned about the examination region such that it excites magnetic resonance in dipoles disposed therein;

an RF transmitter for driving the RF transmit coil;

an RF receive coil for receiving magnetic resonance signals from the resonating dipoles, the RF receive coil including a plurality of loop coils, the plurality of loop coils being disposed in non-orthogonal planes with respect to one another; and

a signal combiner for combining the signals received by the plurality of loop coils selectively in a quadrature combination mode or a phased array mode.

9. A magnetic resonance imaging apparatus as set forth in claim 8 wherein the RF receive coil includes an n X m array of loop coils extending perpendicularly to the main magnetic field and in a direction parallel to the main magnetic field.

10. A magnetic resonance imaging apparatus as set forth in claim 8 wherein the plurality of loop coils have similar geometries with respect to one another.

11. A magnetic resonance imaging apparatus as set forth in claim 8 wherein the RF signals received by the plurality of loop coils have components in first (x) and second (y) directions, the first and second directions being perpendicular to the main magnetic field.

12. A magnetic resonance imaging apparatus as set forth in claim 11 wherein the signal combiner combines the RF signals associated with at least a first and second loop of the plurality loop coils in the first direction by adding said signals phase shifted one-hundred

eighty degrees with respect to one another and the signal combiner combines the RF signals associated with the first and second loops in the second direction by adding said signals in phase.

13. A magnetic resonance imaging apparatus as set forth in claim 8 further comprising switching means for switching the signal combiner from quadrature mode to phased array mode.

14. A magnetic resonance RF coil assembly comprising:

a first loop, the first loop being disposed in a first plane;

a second loop, the second loop being disposed in a second plane; the first and second planes being non-orthogonal; and

a signal combiner for quadrature combining RF signals associated with the first loop with RF signals associated with the second loop.

15. A magnetic resonance RF coil assembly as set forth in claim 14 wherein the first and second loops are disposed adjacent to one another in substantially the same plane.

16. A magnetic resonance RF coil assembly as set forth in claim 15 further comprising means for reducing mutual inductance between the loops.

17. A magnetic resonance RF coil assembly as set forth in claim 14 wherein the first and second loops are both sensitive to RF signals having components in first (x) and second (y) directions, the first and second directions being orthogonal to one another.

18. A magnetic resonance RF coil assembly as set forth in claim 17 wherein the signal combiner combines RF signals associated with the first and second loops in the first direction by adding said signals phase shifted one-hundred eighty degrees with respect to one another and the signal combiner combines RF signals associated with the first and second loops in the second direction by adding said signals in phase.

19. A magnetic resonance RF coil assembly as set forth in claim 14 further comprising switching means for switching the signal combiner from quadrature mode to a phased array mode.

20. A magnetic resonance RF coil assembly as set forth in claim 14 wherein the first and second loops have similar geometries with respect to one another.